

THE INFLUENCE OF HOLISTIC FEED ON PERFORMANCE OF SUPER NATIVE CHICK

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ABSTRACT

This study determines effects of raw material feed (derived from corn, bran, soybean pods, concentrates and *Indigofera zollingeriana* local to Magelang) on the performance of native chicks. Performance was measured by feed consumption, body weight gain, Feed Conversion Ratio (FCR), mortality, and morbidity. This experiment used Completely Randomized Design (CRD) with three different feed treatments, and each treatment consisted of 30 free-range female chicks as replicants, from 0-4 weeks old. Super native chick feed was formulated by trial and error by mixing all ingredients: corn, bran, soybean pods, *Indigofera zollingeriana*, and premix. After mixing, a proximate test determined the nutritional content of the feed. Feed was then administered to chicks. Quantity of feed was administered according to age. The results obtained in the study were analyzed descriptively and statistically using the Variance Test (ANOVA) for the variables of body weight gain, feed consumption, and FCR. The Kruskal Wallis test was used via SPSS 26 program for mortality and morbidity variables with three treatments (T1, T2, and T3) and three replications. Each treatment consisted of 30 research individuals. Results showed that the super native chicks on varied protein diets had a significant difference in performance ($P>0.05$), with feed 3 performing the best feed 3 produced a feed consumption of 430.20 g/chick and body weight gain of 174.67 g/chick, along with 2.46 FCR, 0% mortality, and 3.33% morbidity. The conclusion this study is holistic feed made from local ingredients with the addition of *Indigofera zollingeriana* had a significant effect on increasing average daily gain, increasing feed consumption, and reducing feed conversion ratio (FCR) in native super chick.

Key words: feed, performance, super native chicks

ABSTRAK

Tujuan penelitian ini adalah mengetahui pengaruh pemberian ransum pakan dari bahan baku jagung, bekatul, kulit ari kedelai, konsentrat, dan *Indigofera zollingeriana* yang terdapat di Magelang terhadap performa ayam kampung yang meliputi, konsumsi ransum, pertambahan bobot badan, Feed Conversion Ratio (FCR), mortalitas, dan morbiditas. Dalam penelitian ini digunakan 90 ekor ayam buras betina yang dibagi ke dalam tiga kelompok dengan level protein yang berbeda yang terdiri atas 18.26% (T1), 18.47% (T2), dan 18.36% (T3). Setiap perlakuan terdiri atas 30 ekor ayam buras betina. Pembuatan ransum pakan ayam kampung super menggunakan metode trial and error (dengan cara coba-coba) untuk masa starter (umur 0-4 minggu) dengan mencampurkan semua bahan ransum terdiri atas jagung, bekatul, kulit ari kedelai, *Indigofera zollingeriana*, dan premix. Setelah ransum tercampur maka dilakukan uji proksimat. Setelah dilakukan pengujian, maka ransum dapat diaplikasikan ke ayam. Pemberian ransum juga ditimbang sesuai dengan kebutuhan pakan ayam kampung super menurut umurnya. Hasil yang diperoleh dalam penelitian dianalisis secara deskriptif dan statistik dengan menggunakan analisis varian untuk variabel pertambahan bobot badan, konsumsi ransum, dan FCR. Uji Kruskal Wallis digunakan untuk variabel mortalitas dan morbiditas. Hasil penelitian menunjukkan bahwa performa pada ayam buras yang diberikan ransum pakan dengan kandungan protein yang berbeda memiliki performa yang berbeda ($P<0,05$) dengan performa terbaik terdapat pada T3. Kesimpulan hasil penelitian adalah pakan komplit berbasis bahan lokal dengan tambahan *Indigofera zollingeriana* mempunyai pengaruh yang nyata pada peningkatan pertambahan berat badan harian, meningkatkan konsumsi pakan, dan menurunkan FCR pada ayam kampung super.

Kata kunci: ransum komplit, performa, ayam buras

INTRODUCTION

Animal protein is one source of protein that has increased in need over time, especially chick meat at up to 21.8 g/day/individual (Badan Penelitian dan Pengembangan Pertanian, 2019). Chick meat protein has high economic value for the people of Indonesia. An increase in population and poultry production must match the availability of feed. Increasing chick growth and raising productivity require adequate feed containing high nutritional value both in quality and quantity. Feed is a mixture of various organic and inorganic materials given to livestock to meet the nutrition required for growth, development, and reproduction (Retnani *et al.*, 2011). Provisions for feed-in crossbred chicks must be nutritious and palatable (Samsudin *et al.*, 2012).

The feed was prepared based on the needs of livestock for the purpose of production. Balance of

nutrients, especially protein, will affect chick growth and bone formation, while energy content supports chick activity. Protein is a component of various organs and soft tissues in poultry. These substances are needed for growth, management, and enzyme production in the body (Wahyuni, 2018).

In the livestock business, the cost of feed is the most significant expense, namely 60-70% during the production process (Sidadolog and Yuwanta, 2009). Minimizing production costs without detracting from optimum production can be done by utilizing alternative feed ingredients. Alternatives do not compete with human needs and contain nutrients that are cheap and easy to obtain.

Zainuddin (2011) states that in formulating local livestock rations, one must prioritize local feed ingredients which are relatively cheaper, easily obtained at specific locations, do not compete with human consumption, and are by-products of

agricultural and industrial waste. Efforts to increase native chicks' productivity require the manufacture of rations derived from corn, tofu waste, fish meal, and *Indigofera zollingeriana*, which are known as feed ingredients with high protein content. All feed ingredients are easily obtained in the Magelang area. Thus, the feed release price is estimated to be relatively lower than the manufacturer's feed, while still meeting nutritional requirements. Formulating feed allows forage to be used in poultry feed. An abundance of food crops and agricultural waste holds great potential for the formulation of native chick feed in Magelang.

Therefore, it is necessary to conduct research on the manufacture and administration of complete rations based on local raw materials, namely, corn, rice bran, epidermis, concentrates, and *Indigofera zollingeriana* found in Magelang. Research should examine native feed impact on feed consumption, body weight gain, Feed Conversion Ratio (FCR), mortality, and morbidity. Research will examine impacts on native chicks because Magelang consumers favor native chicks more than broiler chicken.

MATERIALS AND METHODS

This study was conducted at the Poultry Farm Laboratory of Yogyakarta Politeknik Pembangunan Pertanian Yogyakarta-Magelang. Experiments were conducted using completely randomized design (CRD) with three different feed treatments, each treatment consisting of 30 free-range female chicks as replications. Super native chick feed formulation was made by trial and error for the starter period (age 0-4 weeks) by mixing all the ingredients of feed consisting of corn, rice bran, soybean pods, *Indigofera zollingeriana*, and premix. After the feed was mixed, the proximate test was carried out in order to determine the actual nutritional content of the feed. After testing, the feed was administered to chicks. Feed provisions were weighed according to age-based need. Chicks were treated at various levels of feed protein, consisting of 18.26% (T1), 18.47% (T2), and 18.36% (T3) protein content (Wahyuni, 2018). Each treatment consisted of 30 research individuals.

The dependent variable in this study was native chick performance, which included feed consumption, body weight gain, FCR, mortality, and morbidity. The controlled variable was super native chicks from Day Old Chick (DOC) to 4 weeks old (28 days).

Data Analyzed

The results revealed in the study were analyzed descriptively and statistically using the ANOVA for the variables of body weight gain, ration consumption, and FCR. The Kruskal Wallis test was used for mortality and morbidity variables.

RESULTS AND DISCUSSION

Feed Formulation

The process of making feed is an essential part of this research. The following results show nutritional

content analysis of feed material (Table 1), feed formulation (Table 2), and feed nutritional content based on proximate analysis (Table 3).

According to Tables 1 and Table 2, the recommended feed formulation was T3 because its feed ingredients provided more metabolic energy at 2.966,73 kcal/kg, 18.36% crude protein, 6,27% coarse fiber, and 5.89% fat. Among the three formulations, T3 has the most affordable price. Zainuddin (2011) reported that feed for animal production should be selected for the highest composition at an affordable price.

Based on the table above, research was conducted with native chick feed consisting of different protein starters. For four weeks, as many as 90 chicks received treatment with of 18,26% (T1), 18,47% (T2), and 18,36% crude protein (T3).

Increased of Body Weight

Bodyweight gain is calculated based on the difference between initial body weight and final body weight at harvest time (Fahrudin *et al.*, 2016). Analytical results on the 4-week weight gain of super native chicks are listed in the Table 4.

The results demonstrated that T3 were significantly different from T2 and T1. Table 4 shows that the highest body weight gain over four weeks was found in T3, at 174.67 ± 3.46 g/chick. Differences in body weight gain between the treatments above is likely due to differences in energy and protein content in the feed. Content differences affect the FCR, increasing body weight gain. This is in accordance with research by Sidadolog and Yuwanta (2009) which demonstrates that the energy and protein content in feed greatly affects the amount of chick FCR and increases body weight gain. Cahyono *et al.* (2012) reveal that the main factors affecting body weight gain are the amount of energy and protein content in the ration, which critically influence the rate of body weight gain. The factors that influence body weight gain in poultry are species, strains, production types, sex, ambient temperature, season, quality and quantity of feed, production management, feed model, feeding system, and previous weight.

Feed Consumption

Feed consumption is the quantity of feed consumed by animals in a certain period. Administering feeds with different crude protein content in the starter chick super phase varies feed consumption by treatment. Analytical results of feed consumption quantity during the production period can be seen in the Table 4.

The Table 4 illustrates that the highest average feed consumption over four weeks occurred by T1, at 440.87 g/chick. Statistical analysis showed that the treatment had a significantly different effect ($P < 0.05$) on feed consumption. Table 4 reveals that T1 with 18.27% crude protein produced the highest consumption (440.87 g/chick). Lowest consumption was observed in T2 with 18.47% crude protein (413.30 g/ chick). Duncan's test showed that T1 was significantly different from T2, but T1 was not

significantly different from T3. T3 was significantly different from T2. Differences in feed consumption in this study were caused by differences in dietary protein levels between T1, T2, and T3. Differences in metabolic energy content, respectively, were 2,938.74 kcal, 2,909.55 kcal, and 2,966.73 kcal.

Significant differences ($P < 0.05$) in feed consumption among these treatments indicate that feed consumption is highly dependent or influenced by the feed's energy content. If the energy in the feed is high, it will reduce the level of feed consumption. In contrast, low feed energy will increase consumption, as stated by Filawati (2008), concluded that energy content influences the difference in feed consumption. High feed energy reduces consumption while low feed energy increases consumption. Differences in feed consumption show different metabolic energy content in feed, where higher metabolic energy lowers consumption, demonstrating less energy expended. Higher ration energy is better absorbed or digested by the body, producing higher ration efficiency. This corroborates findings by Suciani et al. (2011) and Siabandi et al. (2018) which state that energy content of feed greatly inversely influences the amount of ration consumption, where in high ration energy

correlates with low feed consumption. The feed consumption for each animal is different.

Differences in *Indigofera zollingeriana* content in feed indicate differences in crude fiber content. Many small amounts of crude fiber can increase the digestion rate so many nutrients are lost to excreta. This derives from findings by Wulandari et al. (2013), demonstrating that high quantities of crude fiber feed prevented chicks from utilizing nutrient feed properly; undigested crude fiber would bring nutrients out with excreta. Pangestu et al. (2018) stated that low digestibility leads to much energy being lost through excreta, whereas high digestibility causes energy to be lost through excreta. The amount of undigested crude fiber correlates with metabolic value because undigested crude fiber will carry undigested nutrients out with the excreta. *Indigofera zollingeriana* also decreased feed intake and egg production, but may increase feed conversion in poultry (Tris et al., 2010).

Suprijatna (2005) states that during the production of laying hens, protein level does not significantly affect feed consumption, but does have a significant effect on the percentage of egg production. Widodo (2009) reveals that feed consumption can also be influenced by environmental temperature, chick health, housing, food

Table 1. Nutrition content of feed

Feed Ingredients	EM (kcal/kg)	CP (%)	Fat (%)	CF (%)	Ca (%)	P (%)
Corn	3,370	10.38	2.77	3.36	0.23	0.41
Bran	2,860	11.86	7.13	9.01	0.08	1.23
Concentrate	2,800	28.49	8.00	6.41	9.00	1
<i>Indigofera zollingeriana</i>	1,700	24.47	9.96	19.41	0.22	0.18
Soybean pods	2,898	28.32	5.5	17.98	-	-
Premix	-	-	-	-	5	1

Table 2. Formulation of feed ingredients

Feed Ingredients	Treatments			Ingredient	Price/kg (Rp)
	T1 (%)	T2 (%)	T3 (%)		
Corn	35.50	35.50	35.5		7,500,-
Bran	22.5	20.50	22.20		4,500,-
Concentrate	29	29	31		6,500,-
<i>Indigofera zollingeriana</i>	7.5	10	5		6,000,-
Soybean pods	5.5	5	6		3,500,-
Premix	0.1	0.1	0.1		50,-
Feed price/kg (Rp)	6,290	6,355	6,250		-

T1= Feed ingredients 1st, T2= Feed ingredients 2nd, T3= Feed ingredients 3th

Table 3. Nutritional content of feed ingredients

Feed ingredients	Treatments		
	T1	T2	T3
EM (kcal/kg)	2,938.74	2,909.55	2,966.73
CP (%)	18.26	18.47	18.36
CF (%)	6.57	6.83	6.27
Fat (%)	5.96	6.1	5.89

EM= Energy of metabolism; CP= Crude protein; CF= Coarse fiber

Table 4. Overall research results

Treatment	Monthly gain (g/chick)	Feed consumption (g/chick)	FCR	Mortality (%)	Morbidity (%)
T1	154.0±0.00 ^a	440.87±2.36 ^a	2.24±0.46 ^a	3.33	6.25
T2	129.0±16.74 ^b	413.30±3.16 ^b	2.49±0.58 ^b	13.33	10.0
T3	174.67±3.46 ^c	430.20±2.78 ^c	1.97±0.46 ^c	0	3.33

^{a, b, c}Different superscript within the same column indicates significant differences ($P < 0.05$)

containers, nutrient content in the feed, and stress. Feed consumption in chicks can be influenced by several factors, including age, breed, activity, feed metabolic value, and body weight (Muharlieni and Ani, 2015).

Feed Conversion Ratio (FCR)

Correlation between feed consumption and weight gain is determined by feed conversion (Sidadolog and Yuwanta, 2009). Analytical results of feed conversion ratio, or FCR, can be seen in the Table 4. The Table 4 describes how the varied protein diets resulted in different conversion of feed. Feed conversion from the beginning to the end of production period (4 weeks) increased, demonstrating the longer the production period, the lower the efficiency of feed. Cahyono *et al.* (2012) reveal that a low feed conversion rate results in a lower quantity of rations required to produce one kg of meat; conversely, the higher the conversion of rations, the more financially wasteful.

Table 4 shows that the highest FCR occurred in T2. Observed rates from the first to fourth week were 1.88, 2.28, and 3.25. The lowest FCR occurred in T3. Observed rates were 1.43, 1.75, 2.23, and 2.46. Statistical analysis found that varied protein feeding showed significant difference ($P < 0.05$) in the variable conversion of feed or FCR. Duncan analysis showed that T3 was significantly different from T2, whereas T1 was not significantly different from T2 and T3. The lower the value of feed conversion, the more efficient the use of feed by super native chicks. Lower feed requirements for weight gain in a certain period are due to the conversion of feed in native chicks. This can be affected by crude fiber which is converted into very little body weight. Following Fahrudin *et al.* (2016), the smaller the value of feed conversion, the more efficient the poultry production in converting feed into meat.

Mortality

The influence of *Indigofera zollingeriana* flour ration on super native chicks over 28 days is shown above. There was one mortality in T1, T2 had 4, whereas T3 had zero. Table 10 shows that the best composition for a 0% mortality rate is T3, at 5% *Indigofera zollingeriana*. T2 (10% *Indigofera zollingeriana*) produced the highest mortality rate at 13.33% (four deaths). T1 (7.5% *Indigofera zollingeriana*) followed at a mortality rate of 3.33% (1 death). Kruskal Wallis Test was conducted to determine differences in results.

There is no difference in the mortality rate for rations of different *Indigofera zollingeriana* compositions. This is because the feed composition of *Indigofera zollingeriana* flour remains below 15%, or between 5-10%. According to Wahyuni (2018), administering 1-15% *Indigofera zollingeriana* flour in rations for laying hens did not significantly affect ration consumption, protein consumption, hen-day, and purebred chick egg weight. However, Palupi *et al.* (2014) states that *Indigofera zollingeriana* flour should be administered as less than 7% of poultry feed because

the flour has high crude fiber. As the NPU and metabolizable energy were close to those of soybean meal, top leaf meal of *Indigofera zollingeriana* can be used to substitute protein from soybean meal in poultry feed (Palupi *et al.*, 2018).

Crude fiber requirements in poultry are much smaller than those of other livestock because birds have a monogastric tract, or a single digestive tract. Therefore, use of *Indigofera* plants for poultry feed must be limited. There are few studies on the impact of administering *Indigofera zollingeriana* leaves to poultry because it requires innovations in animal husbandry. Furthermore, most of *Indigofera zollingeriana* forage is used in ruminant livestock rations. For ruminants, 15% of *Indigofera zollingeriana* leaves are classified as small, but significant for poultry (Palupi *et al.*, 2018). Therefore the rations in this study did not exceed 10%.

Mortality of super native chicks over 28 days is thought to be caused by unsuitably high amounts of *Indigofera zollingeriana* flour in the ration; the crude fiber disrupts balance of bacteria in the intestine. This is consistent with Risa *et al.* (2014), stating that bioactive substances in certain herbal concoctions are complementary and beneficial (producing a sparing effect).

In this study, increased fiber in poultry feed is thought to be inversely proportional to feed digestibility. The digestive tract has a vital role in the digestibility of feed ingredients: the morphology of the digestive tract represents livestock condition and digestive ability. Fiber types and fiber sources in poultry rations will impact performance and morphological changes in internal organs, especially the digestive tract (Iyayi *et al.*, 2005).

In the descriptive analysis, T3 produced 0% mortality. This is due to an adequate composition of *Indigofera zollingeriana* flour in feed, which meets the nutritional needs of livestock and creates a balance of microflora in the intestine. Mortality in T1 (7.5% *Indigofera zollingeriana*) and T3 (5% *Indigofera zollingeriana*) is still relatively normal under 5%; the normal limit is 5%. A broiler chick mortality rate of 5% does not greatly affect production costs, but deaths of 20-30% can more drastically affect expenses (Clayton, 1967).

Other causes of mortality in research are environmental factors, such as temperature or weather. The rainy season can strongly impact chicks. In their second week of life, an annual rainy season accompanied by strong winds causes chicks to get cold and more susceptible to disease. This corroborates Nova (2008) which states that the environment influences 70% of success on a farm. Abnormal weather conditions will affect the decrease in feed consumption, decrease body weight, and eventually cause death.

Furthermore, body weight, region, chick type, climate, cleanliness, environment, sanitation, equipment, cage, and environmental temperature, all affect chick mortality. Death usually occurs in the initial period

(starter) but rarely occurs in the finisher period with the exception of respiratory attacks. Death rates fluctuate within any one recording period. A management error may occur wherein mortality rises slightly, then remains or is constant; in such cases, death may be caused by bacteria or other disease (Fadilah, 2004).

Coryza Morbidity

Super native chick feed with varied *Indigofera zollingeriana* flour compositions, administered over 28 days, produced varied coryza morbidities. Super morbidity of native chicks in T1 was 2 out of 30. In T2, morbidity was 3 out of 30, while T3 had 1 out of 30. According to Palupi *et al.* (2014), *Indigofera zollingeriana* functions as an antibacterial and antifungal that strengthens the immune system. The percentage of morbidity or overall disease was 6.67% (6 out of 90). Based on the table above, the highest super chick morbidity occurred in T2, at 10%. T1 followed with 6.25% morbidity, and T3 with 0.33% morbidity. Administration of 5% *Indigofera zollingeriana* is thought to be an appropriate dose for resilient livestock. Kruskal Wallis Test was conducted to determine significant differences in results.

There is no difference in the morbidity rate for *Indigofera zollingeriana* based on differences in feed. However, based on descriptive analysis, it was assumed that 5% flour was an adequate feed dose because it caused a small morbidity rate of just one chick. There were 3 chicks mortalities in the treatment with 7.5% *Indigofera* feed and 2 deaths in the 10% treatment. Diseases that arise during chick development are coryza infection or respiratory disease. Infectious coryza is a respiratory disease in chicks caused by *Avibacterium paragallinarum*, formerly known as *Haemophilus paragallinarum* (Blackall *et al.*, 2005). This disease is very infectious and attacks the upper respiratory tract. It can manifest from acute to chronic. In general, coryza infection causes high morbidity but low mortality (El-Sawah *et al.*, 2012).

Tangkonda *et al.* (2019) states that coryza can be diagnosed based on clinical symptoms and pathological changes. The final diagnosis can be made by isolation and identification of bacteria at an acute stage between 1-7 days after infection. The chick looks sleepy, and there are exudates in the eyes and nose similar to the human cold. Exudates also indicate difficulty breathing, which can cause death. This is reinforced by Blackall and Matsumoto (2003), indicating that clinical symptoms exhibited by livestock with coryza infection experience swelling of the head, runny nose, conjunctivitis, and decreased egg production. However, further research from Tangkonda (2019) states that not all chicks with these clinical symptoms are infected with *Avibacterium paragallinarum*. Preventative measures include maintaining the cleanliness of the cage to reduce germs. Suprijatna (2005) agrees that disease prevention in poultry can be achieved by sanitation, standard feeding, providing a comfortable environment, controlling production management, vaccination programs, and biosecurity.

CONCLUSION

The conclusion this study is holistic feed made from local ingredients with the addition of *Indigofera zollingeriana* had a significant effect on increasing average daily gain, increasing feed consumption, and reducing feed conversion ratio in native super chick.

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